Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2004

United States
Enviromental Protection
Agency

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All data tables of this document are available for the full time series 1990 through 2004, inclusive, at the internet site mentioned above.

For Further Information

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For more information regarding climate change and greenhouse gas emissions, see the EPA web site at <http://www.epa.gov/globalwarming>.

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Higher Tiered, Innovative Approaches for Estimating of U.S. Greenhouse Gas Emissions and Sinks

The photos on the front and back cover of this report depict some of the source categories for which the United States as developed higher tiered or innovative approaches for estimate greenhouse gas emissions or sinks. For these source categories, the United States applies sophisticated modeling approaches, often combined with detailed, bottom-up data. A selection of source categories, representing every sector of the 1990-2004 U.S. Inventory, is presented in these cover photos.

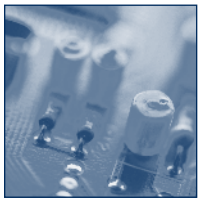
HFC and PFC Consumption from ODS Substitutes: Vintaging Model: The Vintaging Model, used for estimating emissions from the consumption of HFCs and PFCs used as substitutes for ozone depleting substances, is a bottom-up model that independently estimates emissions over the lifecycle of over 50 unique end-uses. The model estimates emissions from refrigeration, air-conditioning, foam manufacturing, solvent use, aerosol use, and fire protection. Using information in end-use growth rates, consumption and emission profiles, lifetimes, and transitions away from ozone depleting substances, the Vintaging Model creates a time profile of HFCs and PFCs emissions, by gas, for the years 1985 through 2030.

Forest Carbon Stock Change: FORCARB2: FORCARB2 is a carbon stock change model that estimates carbon density for live trees, understory vegetation, standing dead trees, down dead wood, forest floor, and soil organic matter. Carbon estimates are based on tree species, dimensions, stand age, region, forest type, and growing stock volume. FORCARB2 carbon coefficients are applied to U.S. forest survey data within each state and summed over all states to estimate net forest carbon stock change for the conterminous United States.

Enteric Fermentation: CEFM: The Cattle Enteric Fermentation Model (CEFM) calculates methane emissions from cattle enteric fermentation based on a "rolling herd" population characterization that tracks cattle energy demand through different growth stages, and addresses the complex problem of simulating the cattle population from birth to slaughter while accounting for the variability in methane emissions associated with each life stage. The model simulates monthly growth stages by cattle type (e.g., beef versus dairy) in a cattle population transition matrix and correlates the energy demands with methane production based on regional diet and animal characteristics.

Non-Energy Uses of Fossil Fuels: A significant proportion of fossil fuels is not burned for energy, but used for petrochemical synthesis, reductants (e.g., for metallurgical processes), and non-fuel products (e.g., asphalt, lubricants, waxes). The U.S. Inventory employs several country-specific mass balance approaches to estimate final emissions from these processes and products. These approaches characterize the fates for each non-energy use of fossil fuels to determine the amount of carbon emissions, or storage, associated with each use.

Mobile Combustion: Estimating CH_4 and N_2O emissions from highway vehicles depends upon a number of engine factors, including fuel characteristics, air-fuel mixes, combustion temperatures, as well as usage of pollution control equipment. The methodology used for the U.S. Inventory applies emission factors per mile that are based on laboratory testing of vehicles by size, fuel type, and control technology. These factors are then applied to estimates of annual vehicle miles traveled (VMT) for these vehicle categories, developed using a combination of data on control technology distribution by model year, vehicle age distributions, and average mileage accumulation.



Semiconductors: PEVM: Estimates of emissions of PFCs from semiconductor manufacturing rely on a combination of industry emission reporting and EPA's PFC Emissions Vintage Model (PEVM). PEVM uses an emission factor based on the historical emissions reported by EPA's semiconductor industry Partners to estimate emissions from the U.S. semiconductor manufacturers who do not report to EPA. PEVM incorporates detailed information on the factors that affect the number of layers, tracking U.S. silicon consumption by linewidth technology and product type. For each linewidth technology and device type, PEVM calculations utilize the number of layers, the silicon consumption and the specific emission factor to obtain emissions.

Landfills: The United States estimates landfill CH_4 emissions using a first order decay model based on the IPCC, applied to three ranges of precipitation in the United States. The data used to estimate national landfill waste generation and disposal data come from published reports and from extensive surveys of historic annual quantities of waste landfilled. Additionally, landfill gas recovered annually is based on data compiled from industry data reports.

Agricultural Soil Management: DAYCENT: N_2O emissions from agricultural soil management are complex and depend on many factors, including weather, soil type, crop type, fertilizer use, and grazing animals. The United States applies the DAYCENT model to estimate direct N_2O emissions from major crops on mineral soils, as well as most of the direct N_2O emissions from grasslands. The DAYCENT model uses national, regional, and county-level data inputs to simulate emissions—a finer-grained and more sensitive analysis than the use of broad emission factors would yield.

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Preface

The United States Environmental Protection Agency (EPA) prepares the official *U.S. Inventory of Greenhouse Gas Emissions and Sinks* to comply with existing commitments under the United Nations Framework Convention on Climate Change (UNFCCC).[1] Under decision 3/CP.5 of the UNFCCC Conference of the Parties, national inventories for UNFCCC Annex I parties should be provided to the UNFCCC Secretariat each year by April 15.

In an effort to engage the public and researchers across the country, the EPA has instituted an annual public review and comment process for this document. The availability of the draft document is announced via Federal Register Notice and is posted on the EPA web site.[2] Copies are also mailed upon request. The public comment period is generally limited to 30 days; however, comments received after the closure of the public comment period are accepted and considered for the next edition of this annual report.

[1] See Article 4(1)(a) of the United Nations Framework Convention on Climate Change <http://www.unfccc.int>.

[2] See <http://www.epa.gov/globalwarming/publications/emissions>.

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